

# Field Mapping GPS

## Using GARMIN GPS 12XL and ArcView

California Department of Fish and Game – Geographic Information Systems Unit

### Prepare:

Design field data collection procedure to meet project analysis and reporting objectives; coordinate and consult with regional and division GIS representatives and biologists involved in data collection.

Design and provide field data entry forms for field data collection. These should include fields for GPS position information, such as: waypoint IDs or track IDs, gpsID, latitude, longitude as well as the resource features and information they represent. Development is currently underway within DFG's GIS unit to establish a selection of uniform fields to assist biologists in developing spatially aware databases that will be easy to integrate with other spatially aware databases. Additional information on this, and a list of suggested fields for inclusion in database development is provided with the course materials. In addition, please feel free to contact any of the DFG GIS analysts for assistance on database development. A list of the GIS analysts is provided at the end of this document.

### GPS Setup:

The following is information on how to setup your Garmin GPS for basic data collection. These methods use established DFG standards:

#### Initialize GPS12XL:

Turn on the GPS unit (press the button with red light bulb)

Allow GPS to acquire readings from satellites (you should be outside and in an open area)

The Garmin receiver usually acquires a position so fast that the initialization is completely automatic. However, initialization may be required after the following:

-memory loss

-if the receiver has been moved more than 500 miles with the power off.

IF you need to initialize the receiver, you can select one of two methods:

Select Country – select your present position from a scrolling list of Countries

Autolocate – allows the receiver to calculate a position

Allow a few minutes for the receiver to initialize. You can verify that you have acquired a position by watching the Satellite page change to the Position page or by looking for a '2D NAV' or '3D NAV' status at the top-left corner of the Satellite page.

Verify valid position indication and proper settings:

Use the page button to access the MAIN MENU page ( if you are just starting up, press the page button 4 times)

From MAIN MENU - Select SYSTEM or SETUP ( if SETUP, you'll have to select SYSTEM from the SETUP MENU page (enter))

MODE: Normal;

OFFSET: -08:00 (PST), -07:00 (PDT)

(page ) go up to main menu

select SETUP or NAVIGATION (enter) ( if SETUP, you'll have to select NAVIGATION from the SETUP MENU page (enter))

POSITION FRMT: hddd.ddddd ( = decimal degrees, probably what you'll want to use, but view your options )

MAP DATUM: NAD27 CONUS

CDI (course deviation indicator): +/- .25 (default)

ANGLE: Degrees;

UNITS: user preference;

HEADING: Auto (compass declination as shown; default GPS12XL bearings are magnetic).

(page ) go up to main menu

select SETUP or INTERFACE (enter) ( if SETUP, you'll have to select INTERFACE inside that screen (enter) )

set first setting below INTERFACE title to GRMN/GRMN

set second setting to HOST

Turning on and off the Track feature:

(page) to the Map Page ( has title of ZM|#|PAN|OPT or ZM|#|PAN|CFG )

highlight OPT or CFG (enter)

highlight TRACK SETUP (enter)

RECORD: Fill (Recommended) or Wrap (which will overwrite points once it has reached 1024) or OFF to turn Track off.

METHOD: Auto (Recommended), or set Time interval to desired amount.

CLEAR LOG? : this will erase all previous track information and start a new track history.

A new track can be started by toggling RECORD: to OFF and then back to FILL or WRAP, or by turning the receiver off and on again.

### **Collect and Record:**

Once you have an active position, the easiest way to save a position is to use the 'MARK' key. Once you press the 'MARK' key the mark position page will appear showing the present coordinates and a default waypoint name. To change the name, select the field, press 'ENTER' and then use the arrow keys to change the name (up / down arrows for characters, left / right to move cursor). Press 'ENTER' to confirm.

To change the symbol, select that field, press 'ENTER' and the symbol page will appear. Select a symbol, press 'ENTER', move the cursor to the 'done' field and press 'ENTER'.

To average a position, move to the average field on the mark position page and press 'ENTER'. The FOM (figure of merit) field will appear and start solving for the most accurate position. Once this figure stops changing, press 'ENTER' to save the waypoint.

Collect resource data on fieldsheets and record GPS positions in the GPS12XL. Link GPS positions to fieldsheet data with waypoint numbers, start and stop times, etc.

## Getting data out of your Garmin:

Once you have collected data with your Garmin, you'll want to get that data out of the Garmin and on to your computer to use in a tabular or spatial database.

A convenient and free option is to use Waypoint+, a shareware windows application to download/upload data to the Garmin GPS's. Waypoint+ enables you to upload and download Routes, Tracks, and Waypoints from a Garmin GPS to a PC, simplifying the processes of creating and editing these data. Saved data files can be in ASCII format with comma delimited fields and can be easily edited using Windows Notepad or Wordpad, taking advantage of their Cut and Paste capability. You can use this application to download your point and track data prior to importing them to ArcView using the AV Garmin extension.

AV Garmin is an ArcView extension developed and written by DFG GIS analyst Isaac Oshima. Used with a Garmin GPS an either Waypoint+ or PCX download software, AV Garmin allows you to easily create shapefiles in ArcView. Point, Line or Polygon features can be created from either waypoint or track data. Shapefiles can be projected into any ArcView supported format.

To learn more about waypoint+ please visit <http://www.tapr.org/~kh2z/Waypoint>

## USING WAYPOINT +

### Installing Waypoint+ program:

To obtain Waypoint+, GPS-to-PC software, use your web browser and go to:

<http://maphost.dfg.ca.gov/adt/download.htm>

Scroll to the CONTENTS section and

Click Waypoint+

Scroll to wplus.exe and download the file. Save it to your hard disk (remember where you are saving the file !)

Close web browser and go to the directory where you have saved the wplus.exe file.

Double-click wplus.exe to install . Please use the default installation directory (c:\wplus) or the shortcut will not work. Hit 'enter' when the DOS windows appear (there will be 2) to continue loading. A wplus folder will be installed on the C:\ drive. The shortcut for the program is located in this folder. Drag the shortcut to the desktop and start the program.

### Setting up Waypoint+ for future download from Garmin GPS:

The following is the standard configuration for DFG files:

From the File menu

Select configuration

Click the Modes tab and select

Decimal Degrees (D),

UNITS: Miles(statute miles)

From the File menu

Select datum

Select North America 1927 Mean (this will be displayed in the status bar at the bottom of the application window) from the scrolling list.

After installation, details are in file c:\wplus\OverviewInfoContents.htm

### **Processing data from the Garmin GPS:**

Connecting Garmin GPS to your PC:

Turn on the GPS12XL and set the Main Menu/Interface to GRMN/GRMN (may already be set to GRMN/GRMN from data collection).

From Main menu, select setup

From setup menu, select interface

From interface menu, highlight first row (enter)

Select GRMN/GRMN (enter)

(page) to return to main menu

Start the Waypoint+ program (if not already running).

Connect GPS12XL data port to PC COM port (usually COM1) with data cable.

If you get a message that the COM port is not available, choose the menu option GPS, then PORT and select another COM port.

Downloading data:

From the GPS menu

Select DOWNLOAD FROM GPS

Next select ALL ( this will launch the download)

To edit Waypoint and/or Tracks as necessary within Waypoint+.

From the WAYPOINT menu

Select LIST WAYPOINTS

Selecting a waypoint in this list will allow you to cut, paste, edit, etc.

From the WAYPOINT menu

Select PLOT WAYPOINTS

This will show you a graphic view of your waypoints.

If date/time are important data to your project, DO NOT alter Waypoint "Description" [due to Garmin bug, this is the only valid date/time storage location].

Similarly, Tracks can be reviewed with sequence: Track/Summary and Track/Plot.

Saving downloaded data:

**Save edited Waypoints and/or Tracks as comma-delimited text files.**

From the FILE menu

Select SAVE

Select WAYPOINT

Navigate to your project directory and enter a filename.

Change the SAVE AS TYPE field to read **COMMA-DELIMITED TEXT FILE !!!**

**Be sure file type is comma-delimited text file... you will need to change the file type as the default is waypoint+.**

Repeat a separate sequence: File/Save/Track for track data. We recommend using a 'wpt' for a point file and a 'trk' for a track file in the file name to help you designate data types.

## **USING AVGARMIN**

### **Installing AV Garmin:**

To obtain the AV Garmin (ArcView extension), use your web browser and go to:

<http://maphost.dfg.ca.gov/adt/download.htm>

Scroll to the CONTENTS section and

Click AVGarmin

Scroll to avgarmin.exe and download the file. Save it to your hard disk (remember where you are saving the file !)

Close web browser and go to the directory where you have saved the avgarmin.exe file.

Double-click avgarmin.exe to install. Accept the defaults for a standard (default) installation into ArcView 3.1 or ArcView 3.2

### **Setting up AVGarmin for future use:**

Start ArcView and add AVGarmin to an ARCVIEW Project

From the FILE menu

Select EXTENSIONS

Select AVGARMIN (put a 'check' mark in the box to select)

Open a new View ( if not already open from start up).

(If you are running ARCVIEW 3.0a, you will need to install and add the ARCVIEW Dialog Designer extension to your ARCVIEW project to be able to use the AVGarmin tools.

You can download ARCVIEW Dialog Designer from

<http://www.esri.com/software/arcview/avsoftware.html>)

To access HELP for the AVGarmin extension, make a View the Active Document, then click Help/About AVGarmin for operating instructions.

### **Converting Waypoint files to Shapefiles for use in ArcView:**

Start ArcView (if not already running) and add the AV Garmin extension.

Once the AV Garmin extension is loaded, a new button will appear on the far right of the button bar.

If you hold the mouse cursor over the button it will read " Load Garmin GPS file". Press that button and a dialog box will appear. Entry the following values:

GPS Input = WayPoint+ (default)

Feature type = WayPoint (default)

View = (select a view ... usually view1 if you are starting a new project)

Projection = ( in most cases you'll use the default, but this is where you would designate if you want a specific UTM zone, or non-standard DFG projection)

Press the Create button and a dialog box will appear asking for the location and name of the WayPoint file. Select the file and press OK. Another dialog box appears and asking you to name the shapefile and determine a location to save the file. Name the file, determine the location where you want to save and press OK. Processing starts and the shapefile is automatically added to your view (IT'S A MIRACLE !).

Use the same process to convert your track file. You'll need to make one change to the AV Garmin dialog box:

Feature type = Track

**Obtaining the ArcView project setup for Sacramento field mapping class:**

Use your web browser and type the following in the address box:

<ftp://maphost.dfg.ca.gov/outgoing/itb/sdt/c511/>

double click the gpsdata.exe file and you will be asked where to save the file (how 'bout c:\temp ?). Select a location, click OK and the file will copy to your hard drive.

Go to the location where you saved the file and double click gpsdata.exe.

You will be prompted for a location to unzip the files (how 'bout c:\temp ?). Select a location and click OK.

Once the unzipping process is complete, double click the c511.apr file.

ArcView will automatically start and display the Sacramento base data.

Add the waypoint and track shapefiles you created to this project.

You can edit the attributes of Shapefiles tables to add fields for entry of fieldsheet data form.

Each record in an "Attributes of ..." table is linked to a single waypoint, polygon (digitized around groups of waypoints), or line segment.

**Clean up, maintenance and other important stuff:**

Prepare documentation (metadata) explaining field procedures, data processing, code meanings, etc.

Back up digital data and metadata.

Prepare GPS receiver for next field event by clearing waypoint and track memory, charging batteries, etc.

## DFG GIS STAFF

<a href="#">Scott Collier</a>	GIS Analyst	916-445-6383	<a href="mailto:scollier@dfg.ca.gov">scollier@dfg.ca.gov</a>	NDDDB
<a href="#">Patrick Gaul</a>	Applications Coordinator	916-322-1950	<a href="mailto:pgaul@dfg.ca.gov">pgaul@dfg.ca.gov</a>	GIS Applications
Rod Gonzalez	GIS Analyst	916-653-5232	<a href="mailto:rgonzalez@dfg.ca.gov">rgonzalez@dfg.ca.gov</a>	Fisheries
Eric Kaufman	GIS Specialist	916-327-8858	<a href="mailto:ekauffman@dfg.ca.gov">ekauffman@dfg.ca.gov</a>	CCRISP
<a href="#">Lora Konde</a>	Spatial Data Coordinator	916-445-5758	<a href="mailto:lkonde@dfg.ca.gov">lkonde@dfg.ca.gov</a>	Spatial Data
Mark Lampinen	GIS Analyst	916-322-4777	<a href="mailto:mlampine@dfg.ca.gov">mlampine@dfg.ca.gov</a>	OSPR
Nancy Wright	GIS Analyst	831-649-2942	<a href="mailto:nmwright@dfg.ca.gov">nmwright@dfg.ca.gov</a>	Marine Region
Judd Muskat	Applications Specialist	916-324-3411	<a href="mailto:jmuskat@dfg.ca.gov">jmuskat@dfg.ca.gov</a>	OSPR
<a href="#">Isaac Oshima</a>	Associate Information Systems Analyst	916-323-1635	<a href="mailto:ioshima@dfg.ca.gov">ioshima@dfg.ca.gov</a>	GIS Applications
<a href="#">Will Patterson</a>	GIS Analyst	916-323-1484	<a href="mailto:wpatters@dfg.ca.gov">wpatters@dfg.ca.gov</a>	Spatial Data
Mary Sommer	GIS Analyst	209-942-6076	<a href="mailto:msommer@dfg.ca.gov">msommer@dfg.ca.gov</a>	Bay-Delta
Chris Stermer	GIS Analyst	916-323-1618	<a href="mailto:cstermer@dfg.ca.gov">cstermer@dfg.ca.gov</a>	Conservation Analysis
Craig Turner	GIS Analyst	916-324-8298	<a href="mailto:cturner@dfg.ca.gov">cturner@dfg.ca.gov</a>	Lands and Facilities
<a href="#">Paul Veisze</a>	Field and Programs GIS Manager	916-323-1667	<a href="mailto:pveisze@dfg.ca.gov">pveisze@dfg.ca.gov</a>	ITB

GARMIN VENDOR LIST	
<p>Garmin International  1200 East 151st Street  Olathe, Kansas 66062  Contact: Don Brown,  Sales Manager/Special Markets  Tel: 913-397-8200  FAX: 913- 397-8282</p>	
<p>West Marine  9500 Micron Road  Sacramento, CA 95827  Contact: Dirk  Tel: 916-366-3300  FAX: 916-366-8872</p>	
<p>Port Supply  500 Westridge Drive  Watsonville, CA 95075  Contact: Chris Deaver  Tel: 800-621-6885  FAX: 800-825-7678</p>	
<p>Pacific Survey Supply  908 N. Riverside Avenue  Medford, Oregon 97501  Contact: Perry Wickham  Tel: 800-866-9130  FAX: 541-772-3825</p>	
<p>Maritime Electronics  of Sausalito  300 Harbor Drive  Sausalito, CA 94965  Contact: Tony  Tel: 415-332-5086  FAX: 415-332-6344</p>	

Star Marine Electronics 2415 Mariner Square Drive Alameda, CA 94501 Contact: Ron Jones Tel: 510-769-7827 FAX: 510-769-7834	
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In Addition, GARMIN GPS units can easily be found at REI, FRY's Electronics, Kmart (to name a few).

## DFG GIS Unit extensions: Tips and Tricks

The DFG GIS Unit tries to create tools that are compatible with each other. For example, the ArcView extensions: AV Garmin and AV Geotools (formerly DFG Geotools) work together. AV Garmin takes Garmin/Waypoint+ formatted files and create shapefiles in ArcView; either point, lines or polygons (GPS -> ArcView). AV Geotools takes user input from ArcView and outputs Waypoint+ formatted files (ArcView -> GPS).

- 1) Output from one extension can be the input to the other.
- 2) Accept the default naming of waypoints (001,002,003,etc....) and record on your rite-in-the-rain the associate attributes for each waypoint. This speeds the capture of waypoints and it makes it easier to create polygonal features should you need to do so.
- 3) Do not change the comments for waypoints on your Garmin GPS unit. There is a bug in the Garmin firmware, the default date and time fields contain incorrect data. The correct date and time, however is contained in the comment field.
- 4) Even though the Garmin will not explicitly indicate, either turning your unit off and on while collecting track data OR turning track collection off and on while collecting track data will make it possible to differentiate between tracks. For example, if you are trying to walk several perimeters in order to create polygons.
- 5) Use waypoint+ shareware to download data instead of Garmin's old PCX software. In future, Garmin's new MapSource software will be supported as well.
- 6) Remember that only waypoints and tracks are supported by the DFG GIS extensions; routes are not supported since these are really a series of waypoints and are meant for real-time navigational purposes.
- 7) If you have an ArcView theme and would like to upload the position(s) (lat/lon) of some selected feature to your Garmin then use AV Geotools. AV Geotools will create a Waypoint+ formatted file of the centroids of the selected features. You

can then load this file into Waypoint+ and upload the data. For example, you can use this method to go visit (navigate to) past sampling sites or survey locations.